

## Sewage sludge economics

A farmer is having municipal sewage sludge applied again this spring, to 133 acres in Northumberland County, near the intersection of VA 200 and VA 679 (Cross Hills Road). What are the plusses and minuses?

According to the Joint Legislative Audit and Review Committee Report No. 89, the farmer will save about \$56/per acre, or about \$7,500 by not having to purchase commercial fertilizer.

The crop to be grown, corn, requires about 130 pounds of nitrogen per acre. At the time of harvest, the corn grain harvested from one acre will contain about 80 pounds of nitrogen. If chemical fertilizer is used, about 50 pounds of nitrogen (130 minus 80) will be released to the environment per acre. Sewage sludge (poultry litter is currently nearly unregulated) is applied on the basis that only about 30% of the nitrogen is crop-available the first year. This is because it takes time for microbes to release the nitrogen and phosphorus from animal waste just as it takes time for a fallen tree to decompose, in contrast to the nitrogen and phosphorus in chemical fertilizer, which is immediately available to the crop. To supply the crop with 130 pounds of nitrogen, 433 ( $130/0.3$ ) pounds of nitrogen must be applied in sewage sludge. This means that 353 (433 minus 80) pounds of nitrogen is released to the environment. Some of that excess nitrogen will be taken up by subsequent crops IF the farmer reduces chemical nitrogen application in subsequent years. In order to save himself \$7,500, the farmer will apply 23.5 tons of nitrogen ( $353 * 133 / 2000$ ) to his fields to no benefit of the crop, the equivalent of 9,400 50# bags if 10-10-10. It has been estimated that each pound of nitrogen pollution costs society between about \$0.90 and \$2.20 (Journal of Agricultural and Resource Economics, 2002, v. 27, p. 420-432). Using the more conservative figure, the farmer saves \$7,500 but it costs the rest of us \$42,000.

The crop also needs phosphorus. Plants require less phosphorus than they do nitrogen, yet sludge contains nearly as much phosphorus as it does nitrogen. Nutrient management plans are essentially “nitrogen-based” and the restrictions on phosphorus application are practically non-existent, in my scientific opinion, so as not to restrict land application. The fields in question will receive about 379 pounds of phosphorus per acre whereas the crop only needs about 60 pounds. So in order to save himself \$7,500, the farmer will apply 21.3 tons of phosphorus to his fields to no benefit of the crop. There is obviously additional cost to society from the phosphorus pollution of Chesapeake Bay that will result.

Municipal sewage sludge from the Blue Plains wastewater facility contains about 450 coliform bacteria per dry gram. To supply the nitrogen needs of the crop, about 20 tons of (wet) sludge (one trailer truck-load) will be applied per acre. In order to save himself \$7,500, the farmer will apply 1.6 Billion coliform

bacteria in each truck-load, for a total of 200 Billion coliform bacteria to his fields. The nearest waterways, Mill and Dividing Creeks, are both restricted for the harvesting of shellfish because of high fecal coliform bacterial levels. What do you suppose is the probability that gulls (“birds follow the plow”), raccoons, deer, etc. will further contaminate the creeks with bacteria from these fields?

Sewage sludge is known to contain numerous harmful chemicals, including things like Brominated flame retardants. A very worrisome new finding is that sludge also contains numerous pharmaceuticals. We excrete large quantities of the drugs we take, and because drugs are designed to have a relatively long shelf life, they can persist in the environment. Many drugs have powerful effects on life processes, even in very small quantities. The United States Geologic Survey finds (see the Feb. 8 Washington Post) that estrogens and other hormones released to the environment, some from sewage sludge, may be “... causing male fish to take on female characteristics.” It is also commonly accepted that over-use of antibiotics can promote the development of antibiotic-resistant strains of bacteria, and antibiotics are known to be present in both sewage sludge and poultry litter. Is it a good idea to disseminate sludge and poultry litter into the environment without knowing more about the consequences of disposing of these kinds of substances by land-application?

It is well documented that human health problems can be caused by the use of sludge as a soil-amendment. The problems are often respiratory or digestive, and are similar to the problems reported by workers at wastewater plants. It is alleged that several people have died as the result of land application of sewage sludge. A good analogy is peanuts. Most people enjoy peanuts. But a few people get sick and a very small number of people die. Just as a few people are allergic to peanuts, a few, especially those with compromised immune systems and respiratory problems, appear to be much more sensitive to aerosols, pathogens and other substances released to the environment as the result of land application.

The farmer is within his legal right to use sewage sludge. But it is clear that there are negative consequences for rest of us. Do the positives for farmers outweigh the negatives for society? The State and EPA continue to conclude that societal concerns are of little consequence, and that the profits of a few special interests are more important than the well-being of society, including water quality in Chesapeake Bay. The only way that the disposal of animal wastes by land application will be banned, so that the animal waste can be used as biofuel, is if we elect officials who are willing to understand the issues and effect change based on society’s needs rather than the profits of special interests.

Additional discussions can be found in my articles published in the December 2006 and May 2007 issues of the Bay Journal ([www.BayJournal.org](http://www.BayJournal.org)),

already provided to the “Biosolids Expert Panel,” and on my web site [www.VaBayBlues.org](http://www.VaBayBlues.org).

Dr. Lynton S. Land, P. O. Box 539, Ophelia, VA 22530, Feb. 22, 2008